



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,717	07/15/2003	Norihiko Ui	030864	7409
23850	7590	02/28/2006		
ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP 1725 K STREET, NW SUITE 1000 WASHINGTON, DC 20006			EXAMINER ROSE, KIESHA L	
			ART UNIT 2822	PAPER NUMBER

DATE MAILED: 02/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

7

<b>Office Action Summary</b>	<b>Application No.</b> 10/618,717	<b>Applicant(s)</b> UI ET AL.	
	<b>Examiner</b> Kiesha L. Rose	<b>Art Unit</b> 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 November 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/7/05</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

This Office Action is in response to the RCE filed 28 November 2005.

### ***Information Disclosure Statement***

The information disclosure statement filed 7 September 2005 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1 and 5 disclose a source region and a drain region each having a bottom face above an interface that is defined between the predetermined semiconductor layer and is provided within the channel layer. It is unclear where the interface is formed between the predetermined semiconductor and what other layer. Also is the source and drain region formed within the channel layer or

Art Unit: 2822

is the interface formed within the channel layer. Since it is unclear what the limitations mean, for the purposes of examining the claim limitation in question is being read as:

**a source region and a drain region each having a bottom face and is provided in the channel layer**

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2 and 4, as far as understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Sakamoto et al. (U.S. Patent 6,333,523).

In re claim 1, Sakamoto discloses a field effect transistor (Figs. 1-2) that contains a channel layer (13) that is formed on a predetermined semiconductor layer (12) and has an impurity concentration varying from a low value to a high value (Fig. 2) and a source region (19) and a drain region (18) each having a bottom face and is provided in the channel layer.

In re claim 2, the impurity concentration varies exponentially. (Fig. 2/ Abstract)

In re claim 4, the impurity contained in the channel layer is at least silicon.  
(Column 3, lines 21-22)

Claims 5-7, as far as understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Matsuzaki et al. (U.S. Patent 5,493,136).

In re claim 5, Matsuzaki discloses a field effect transistor (Fig. 3) that contains a channel layer (3/5/7) that is formed on a predetermined semiconductor layer (2) and has a composition (concentration is increasing as the distance from the predetermined semiconductor layer increases (Column 5, lines 13-26)) in which a saturation electron velocity varies from a low value to a high value as getting away from the predetermined semiconductor layer and a source region (10) and a drain region (12) each having a bottom face and is provided in the channel layer. (Column 2, lines 62-67 and Column 5, lines 41-63) Since Matsuzaki discloses a channel having a composition where the concentration increases as the distance from the predetermined semiconductor layer increases, then it would be inherent that the saturation electron velocity would vary from a low value to a high value as getting away from the predetermined semiconductor layer.

In re claim 6, the channel layer has a composition ratio of a predetermined material linearly or exponentially decreasing or increasing as the distance from the predetermined semiconductor layer increases. (Column 5, lines 13-26)

In re claim 7, the predetermined material is at least gallium. (Column 4, line 29)

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2822

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakamoto as applied to claim 1 above, and further in view of Kim et al. (U.S. Patent 4,641,161).

Sakamoto disclose all the limitations except for the impurity concentration of the channel to be  $1.0 \times 10^{16}/\text{cm}^3$  or higher. Whereas Kim discloses a field effect transistor (Fig. 1) that contains a channel layer (14) with an impurity concentration of  $1.0 \times 10^{16}/\text{cm}^3$  or higher. The channel as the set impurity concentration to minimize series resistance. (Column 7, lines 61-63) Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Sakamoto by incorporating the channel layer to have a impurity concentration of  $1.0 \times 10^{16}/\text{cm}^3$  or higher to minimize series resistance as taught by Kim.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuzaki as applied to claim 5 above, and further in view of Kim et al. (U.S. Patent 4,641,161).

Matsuzaki disclose all the limitations except for the bottom faces of the source and drain regions being located within the channel layer. Whereas Kim discloses a field effect transistor (Fig. 1) that contains a substrate (10), a predetermined semiconductor layer (12) that is a buffer layer, channel layer (14), a source and drain region (24) having a bottom face located within the channel layer. The bottom faces of the source and drain regions are formed within the channel layer to reduce series resistance. (Column 5, lines 53-56) Therefore it would have been obvious to one having ordinary

Art Unit: 2822

skill in the art at the time the invention was made to modify the device of Matsuzaki by incorporating the bottom face of the source and drain regions to be formed within the channel layer to reduce series resistance as taught by Kim.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-8 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kiesha L. Rose whose telephone number is 571-272-1844. The examiner can normally be reached on T-F 8:30-6:00 off Mondays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "K. L. Rose", is located at the bottom left of the page.